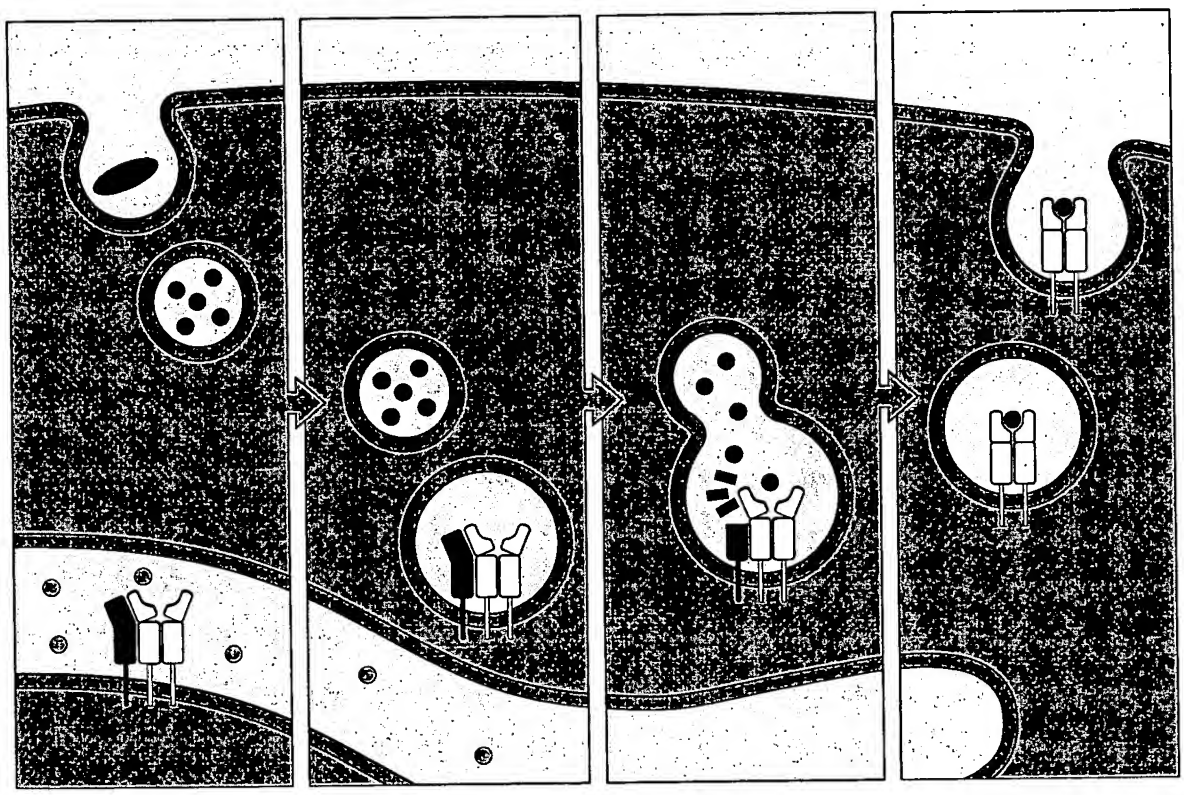
IMMUNOBIOLOGY

THE IMMUNE SYSTEM IN HEALTH AND DISEASE



JANEWAY • TRAVERS

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THE IMMUNE SYSTEM IN HEALTH AND DISEASE

Charles A. Janeway, Jr.
Yale University Medical School

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Paul Travers
Birkbeck College, London University

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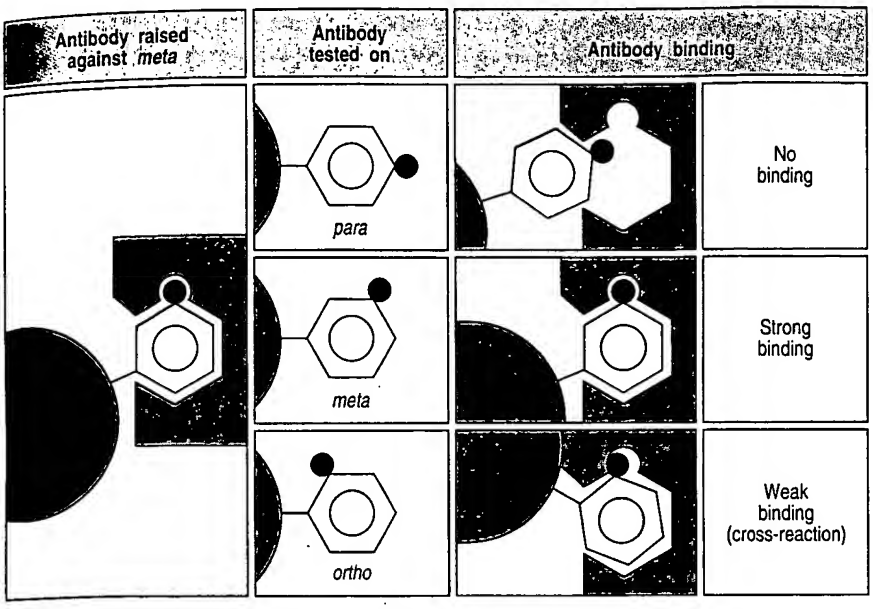

Fig. 2.2 Anti-hapten antibodies can distinguish small changes in hapten structure. Antibodies raised to the *meta*-substituted azobenzenearsonate ring react predominantly with the *meta*-form, and have limited cross-reactivity with the *para*- and *ortho*-forms. The particular antibody shown here fits the *meta*-form perfectly, weakly binds to the *ortho*-form, and does not bind the *para*-form.

Fig. 2.2), and even in some cases with antigens having no clear relationship to the immunogen. These cross-reacting antibodies can create problems when the antiserum is used for detection of specific antigen using the techniques outlined in the next part of this chapter. They can be removed from the pool of antibodies in an antiserum by **absorption** with the cross-reactive antigen, leaving the remaining antibodies that bind only to the immunogen. The problems resulting from the heterogeneity of the antibodies present in an antiserum can be avoided by making **monoclonal antibodies**, which are homogeneous antibodies derived from a single antibody-producing cell (see Section 2-11).

The antigens used most frequently in experimental immunology are proteins, and antibodies to proteins are of enormous utility in experimental biology and medicine. Therefore, we will focus in this chapter on the production and use of anti-protein antibodies. While antibodies can also be made to haptens, to carbohydrates, to nucleic acids, and to other structural classes of antigen, their induction generally requires the attachment of the antigen to a protein carrier. Thus, it is the immunogenicity of protein antigens that determines the outcome of virtually every immune response.

2-2 The immunogenicity of a protein reflects both its intrinsic properties and host factors.

Although any structure can be recognized as an antigen, only proteins elicit fully developed adaptive immune responses, because only proteins can engage the T lymphocytes required for immunological memory. This occurs because T cells recognize antigens only as peptide fragments of proteins bound to self MHC molecules (see Section 1-14). An adaptive immune response that includes immunological memory can only be induced by other classes of antigen when they are attached to a protein carrier that can engage the necessary T cells. Thus, immunogenicity must be defined in respect of the response to protein antigens. When proteins or hapten–protein conjugates are used for immunization, immunological memory is